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Characterization of the Physical Properties of the Ancient Nanostructured Biomaterials (Nacre Layer) Retrieved Using Ethylenediaminetetraacetic Acid (EDTA)

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Abstract. Nacre can be found in many seashells species made up of about 95% of volume of multilayer structure of crystalline aragonite and consists of both inorganic and organic biomaterial. Nacre is one of the natural structural materials which constructed at ambient temperature having hard and soft phases arranged in multifaceted hierarchical architectures, thus spanning the characteristic dimensions from the nanoscale to the macroscale. The physical characteristics of the retrieved nacre powder from the nacre layer by using ethylenediaminetetraacetic acid (EDTA) method were analyzed by means of X-ray fluorescence (XRF), X-ray diffraction (XRD), Fourier Transform Infrared (FTIR) Spectroscopy, and thermal analyzer Differential Scanning Calorimetry (DSC)/Thermogravimetric (TGA). XRF analysis revealed the high content of calcium carbonate in comparison to the untreated nacre. The XRD confirmed the aragonite properties of the retrieved nacre while FTIR spectroscopy identified the calcium carbonate phases due to the differences in carbonate ions, CO_3^{2-} . Simultaneous thermal analyzer (DSC/TGA) was used for analysis of the thermal decomposition of the retrieved nacre powder. Here, we successfully evaluated the properties of the ancient nanostructured biomaterial; nacre retrieved using EDTA for future application in bone tissue engineering.

Keywords: Nacre, biomaterial, bone, tissue engineering